

**UNITED STATES
DEPARTMENT OF THE INTERIOR
HAROLD L. ICKES, SECRETARY**

**BUREAU OF MINES
R. R. SAYERS, DIRECTOR**

INFORMATION CIRCULAR

**SOME INFORMATION ON THE TRANSPORTATION, STORAGE, AND
HANDLING OF LUBRICANTS IN AND ABOUT COAL MINES**



BY

D. S. KINGERY

INFORMATION CIRCULAR

UNITED STATES DEPARTMENT OF THE INTERIOR - BUREAU OF MINES

SOME INFORMATION ON THE TRANSPORTATION, STORAGE,
AND HANDLING OF LUBRICANTS IN AND ABOUT COAL MINES^{1/}

By D. S. Kingery ^{2/}

CONTENTS

	<u>Page</u>
Introduction.....	2
Transportation of lubricants.....	2
Facilities for storing lubricants necessary to maintain mechanical equipment in mines.....	5
Recommended practices for transporting, storing, and handling lubricants.....	6

<u>Figure</u>	<u>Following Page</u>
1. Diagram of pressure grease car.....	2
2. Pressure grease car.....	2
3. Pressure-type grease car being loaded from bulk storage tank.....	2
4. Three-compartment, double-tank pressure grease car..	2
5. Lubricating a loading machine with pressure-type grease car.....	2
6. Diagram of grease cars for transporting lubricants into the mine.....	4
7. Diagram of grease-storage box.....	4
8. Diagram of grease-storage box.....	4
9. Diagram of knockdown steel grease-storage box.....	4
10. Diagram of fireproof grease-storage car.....	4
11. Underground, fireproof, lubricant-storage house with sunken storage tanks.....	4
12. Outside bulk storage tanks for mine lubricants.....	4

- ^{1/} The Bureau of Mines will welcome reprinting of this paper provided the following footnote acknowledgment is used: "Reprinted from Bureau of Mines Information Circular 7244."
- ^{2/} Associate mining engineer, Safety Division, Bureau of Mines, Pittsburgh, Pa.

INTRODUCTION

Recent Federal coal-mine inspections have revealed some good and some definitely hazardous practices and systems for transporting, handling, and storing lubricants in and about coal mines.

Improper storage or handling of lubricants in coal mines has caused disastrous mine fires or, by supporting combustion, has made fires from other sources more difficult to fight. Careless handling of grease and oil around electrical equipment wastes much oil and permits entrance of grit and foreign substances into the working parts, which causes excessive wear and increases the possibility of electrical ignition.

Mechanical-loading and multiple-shift operations complicate this problem. The operation of mechanical equipment for two or three shifts daily requires an available supply of two to four different types of lubricants. These must be transported and stored safely as otherwise they present a constant threat to the safety of the mine and to continued operation of the equipment.

The importance of storing and handling lubricants to prevent their contamination cannot be overemphasized. This means that open containers must be banned and great care must be taken in transferring greases by hand.

Convenient facilities for handling lubricants are necessary to enable employees to store, dispense, transport, and apply them with proper care. Facilities for lifting heavy containers should be provided in the oil house on the surface or in the oil room underground. Concrete floors that can be cleaned thoroughly and barrel pumps, drip pans, and safe and efficient lights are required.

Responsibility for handling and using lubricants should not be divided. Individual containers should be provided for each man whenever possible.

Many coal-mine operators are showing a definite interest in lubricants from the standpoint of safety, elimination of waste, and preventive maintenance. Some operators have developed commendable systems and practices for this important phase of mining, and undoubtedly many others are interested in the subject.

This circular describes some of the better systems now in use and outlines recommended practices for transporting, storing, and handling lubricants in and about coal mines.

TRANSPORTATION OF LUBRICANTS

Use of portable-type lubrication cars is the safest and most efficient method of transporting, distributing, and using grease and oil inside coal mines. These cars are either of the special pressure-pump lubricating type or are special cars used to transport containers of lubricants from place to place. The special pressure-pump type serves the dual purpose of transporting the lubricants and providing the medium and equipment for lubricating the

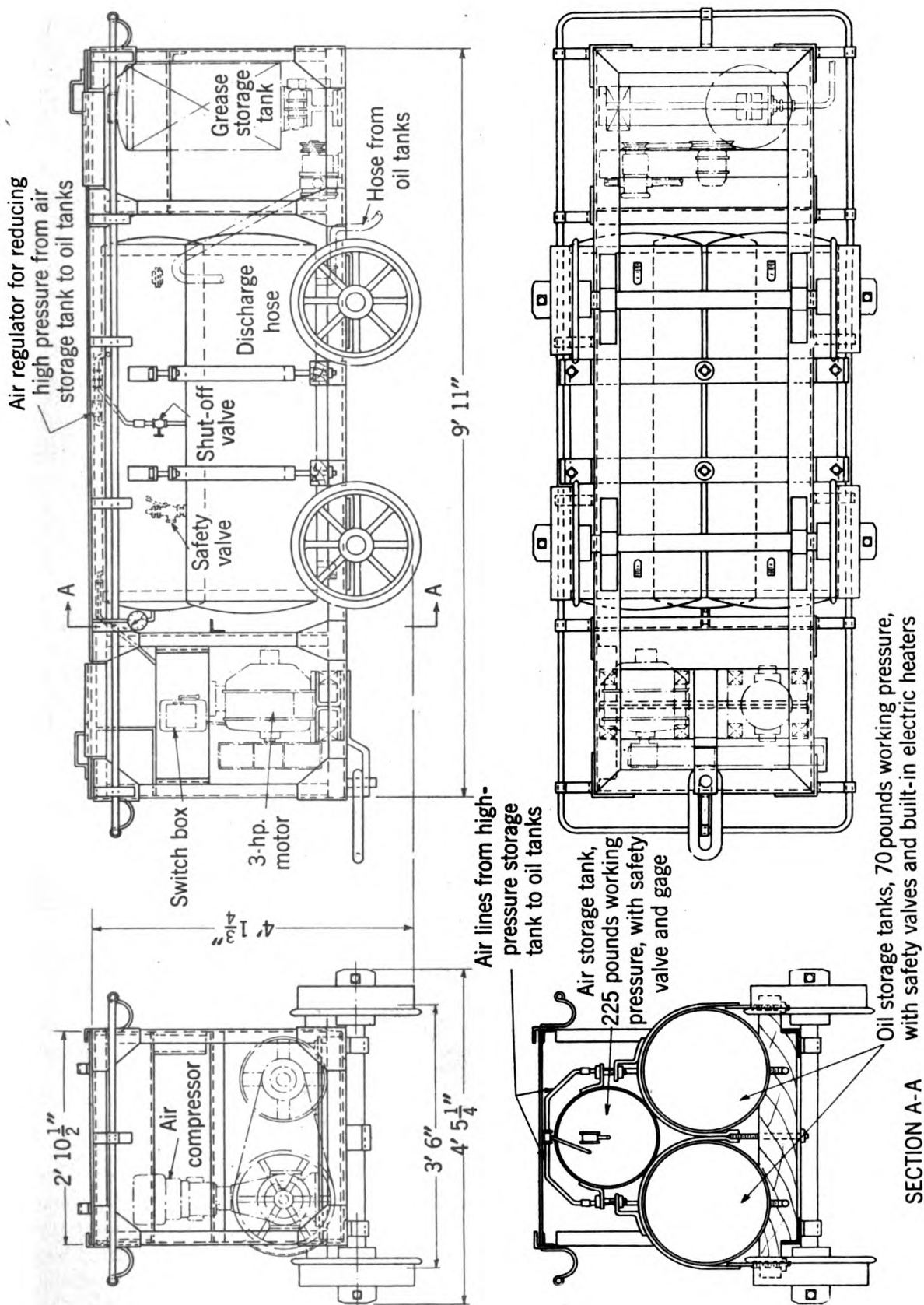


Figure 1.— Pressure grease car.

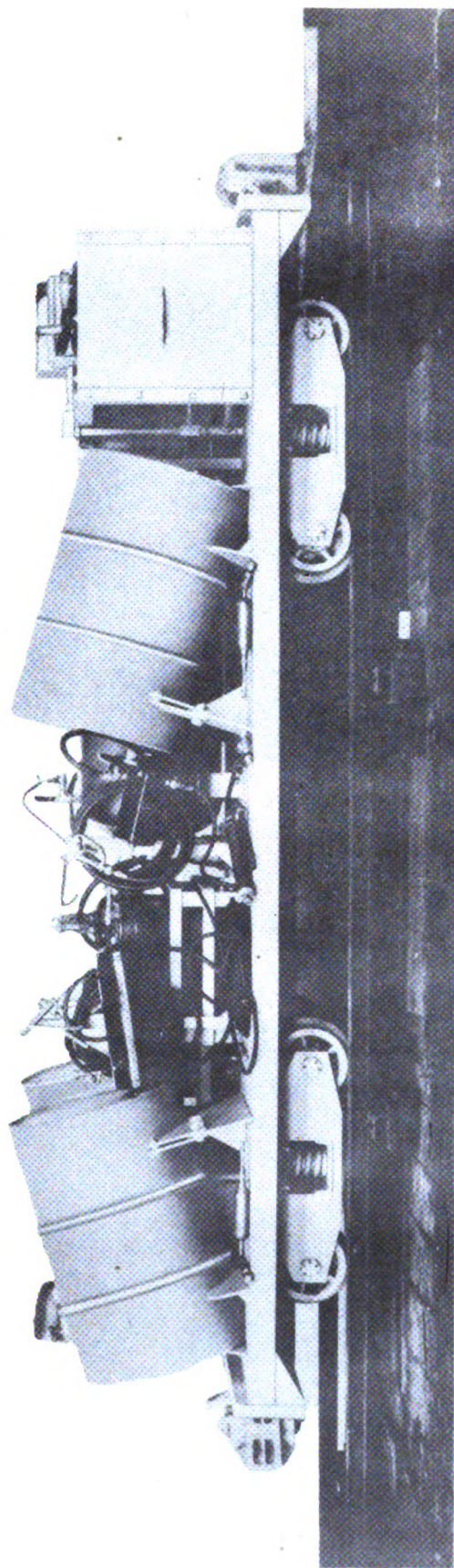


Figure 2.— Pressure grease car.

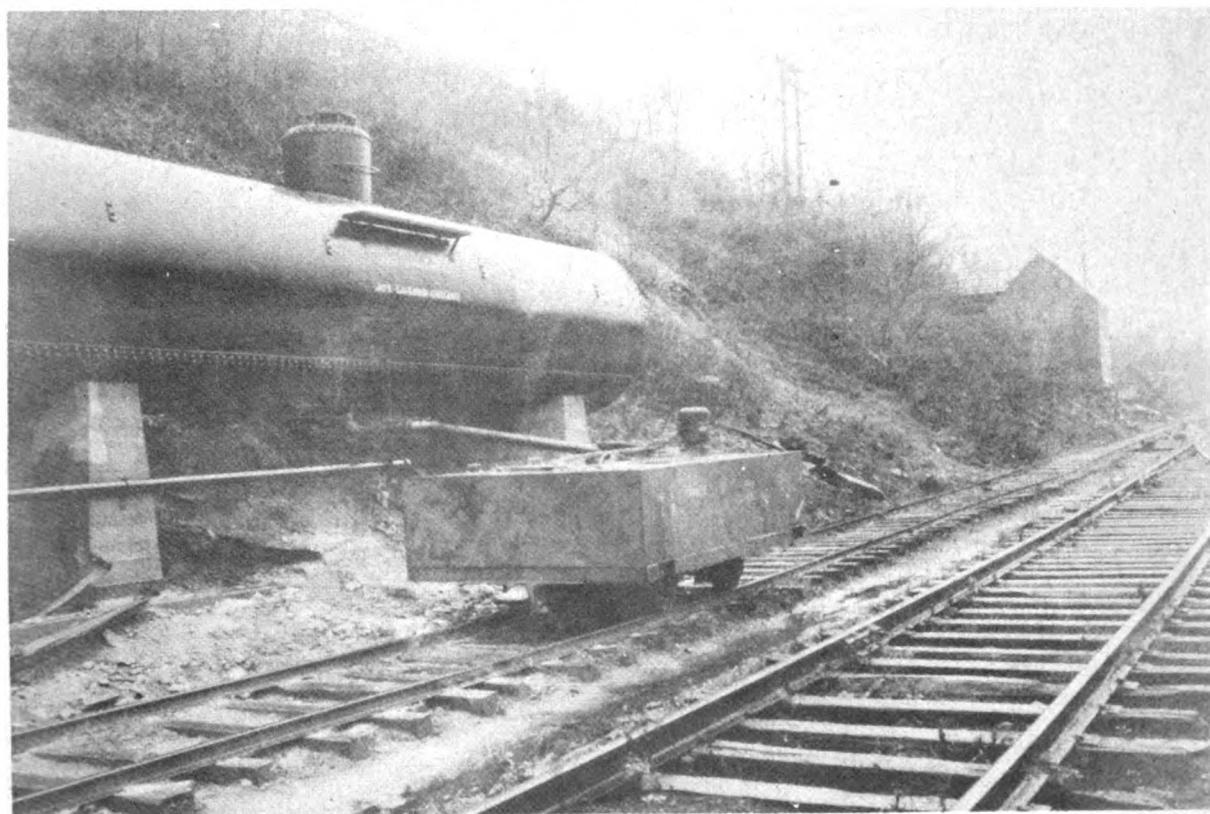
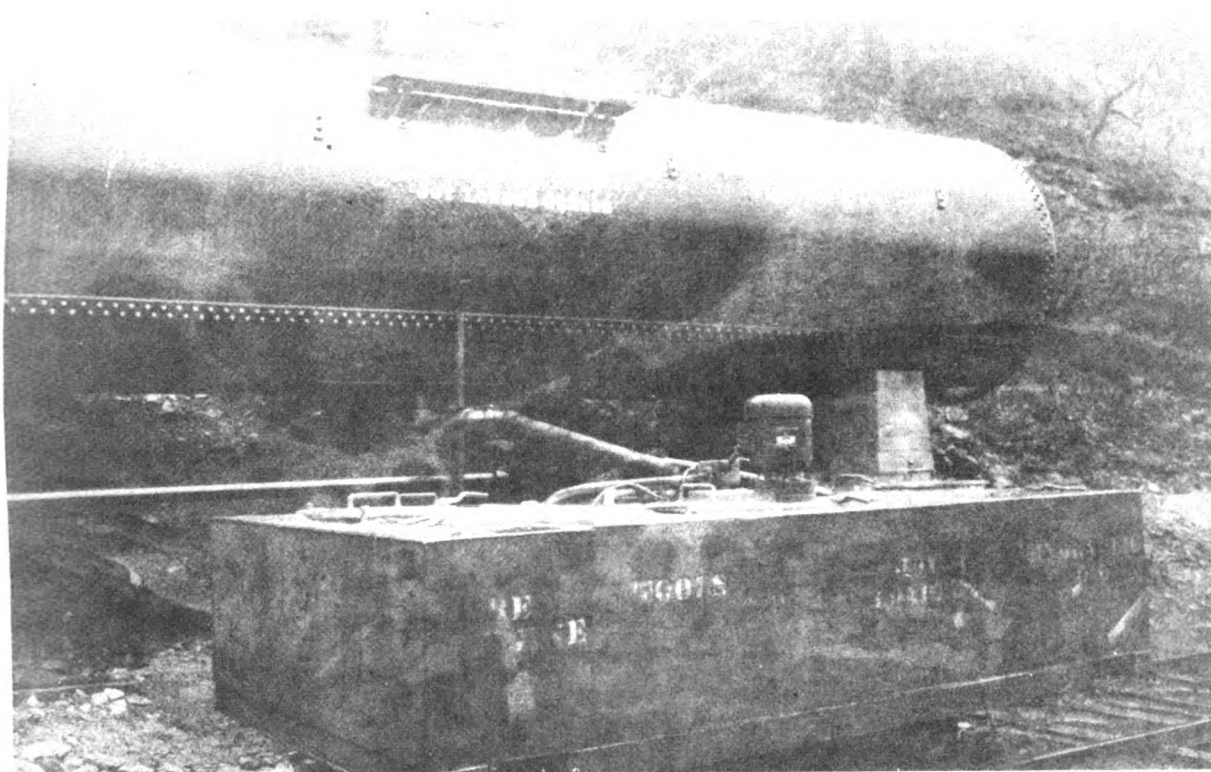


Figure 3.— Pressure—type grease car being loaded from bulk storage tank.

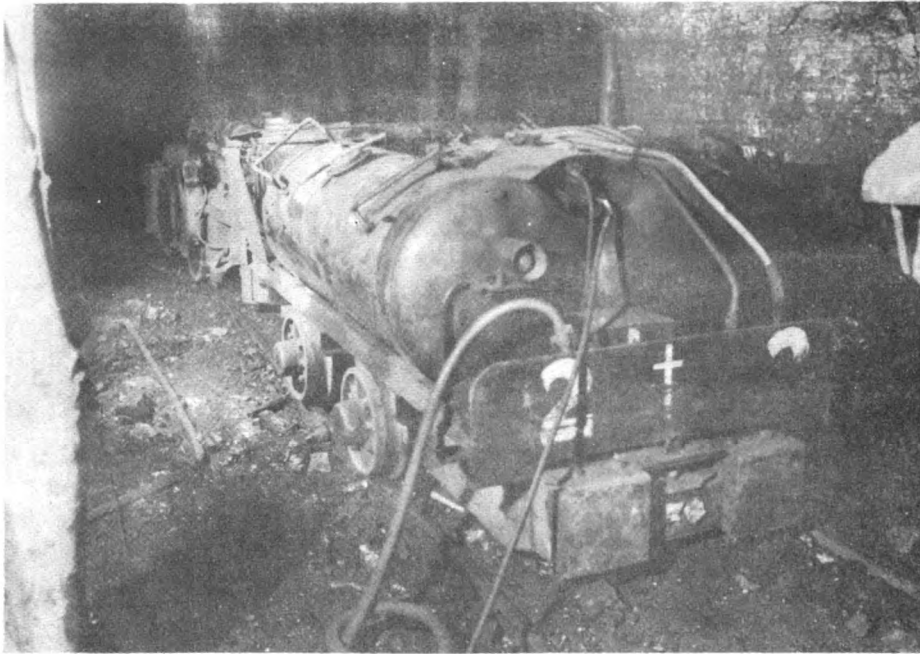


Figure 4.— Three-compartment, double-tank pressure grease car.

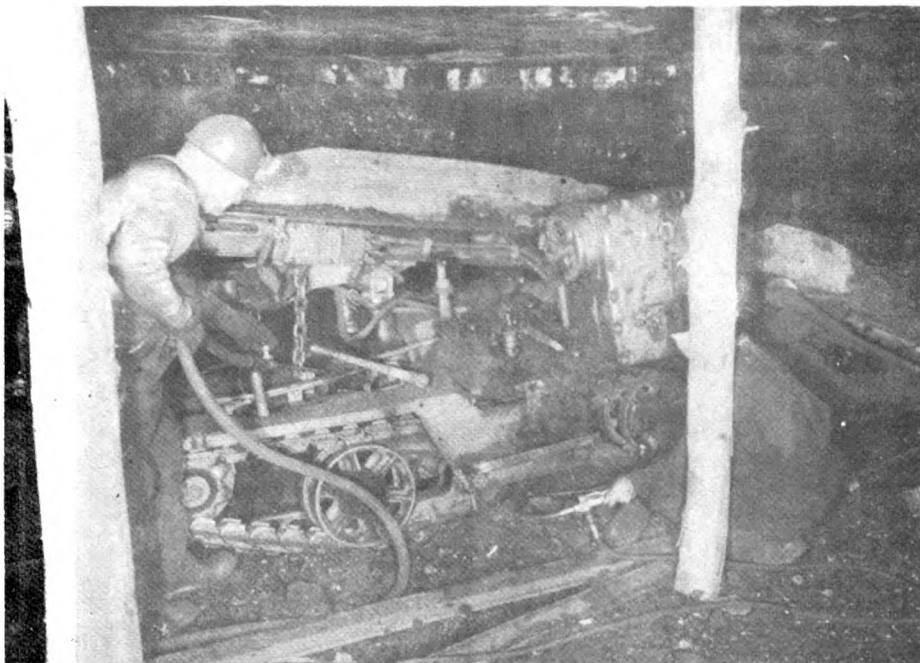


Figure 5.— Lubricating a loading machine with pressure-type grease car.

machinery with minimum handling, and eliminates inside storage and exposure of the lubricant to possible contamination. This method also provides a preferred lubrication job, which can be done during the idle shift and be included with routine inspection of the equipment.

Several different types of portable cars now in service are illustrated in the following figures:

Figure 1 is a diagram of a pressure-type lubricant car specifically designed to service mechanical equipment. With this type of car, mechanics or special greasers can lubricate all equipment during the nonworking shifts or between shifts and thus eliminate the need for storing oil or grease in the mine, only a small lubricant gun being required for servicing the equipment during the working shifts.

Figure 2 shows a different, improved, pressure-type lubricant car, utilizing portable grease drums and electric lubricating guns. This car is used as described above; the lubricating is done during nonworking shifts by special greasers or mechanics and virtually eliminates the need for lubricant storage facilities near the mechanical equipment.

Figure 3 shows a pressure-type lubricant car being filled from a surface bulk storage tank. This car has been used successfully at a mechanical coal mine that operates two of these pressure-type cars; one car is used exclusively for servicing loading equipment and the other for servicing cutting machines and drills. These cars are constructed of 3/8-inch sheet steel and are divided into three lubricant compartments. The cars are equipped with an electric grease gun and fittings and enough rubber hose to reach and lubricate the mining equipment. The capacity of each car is about 4 days' supply of lubricants; while not in use, the cars are stored in a fireproof enclosure built inside the mine for that purpose. The cars are brought outside only for refilling. All equipment is lubricated by a regular crew of greasers during the idle shift. This insures adequate lubrication of each piece of equipment and a routine check-up after each 14 hours of service. These lubricant cars are also equipped with tools for the mechanics and a fire extinguisher.

Figure 4 illustrates a pressure-type lubricant car similar to that shown in figure 1. Some of the specifications for this car are: Over-all length, 9 feet; height, 48 inches above the rail; and width, 52 inches. The car is equipped with two horizontal lubricant tanks 26 inches in diameter and 65 inches in length. Each tank has a capacity of 150 gallons. One tank is divided by a bulkhead into 100-gallon and 50-gallon compartments, enabling the car to carry three types of grease. The tanks are built of rolled steel, electrically welded.

This car is equipped with flowmeters to register the amount of oil or grease passing into the mining equipment. Attached to each meter is a 1 inch flexible hose about 40 feet long, which enables the greaser to reach any part of the equipment to be lubricated. At the rear end of the tanks is a regular traction brake motor and air compressor equipped with an automatic electric control switch, safety pressure release valve, and pressure indicating gage.

9477

A constant pressure of 120 pounds per square inch is maintained in each tank to provide pressure for greasing. This type of grease car proved so satisfactory at one mine that an additional unit was built.

Figure 5 shows equipment of the pressure-type grease car described in figure 4 in operation. Two men constitute a greasing crew. All lubricating is done on the third shift, which means that each piece of mining equipment is lubricated after 14 hours' service; routine inspections of equipment are made in conjunction with the greasing. The company using this car maintains accurate records of the amount of lubricant used on each piece of mining equipment. These records are used in preparing cost reports and forecasting the mechanical condition of the equipment, as indicated by excessive consumption or loss of grease or oil.

The upper half of figure 6 is a diagram of a special car used to transport 3- and 5-gallon grease and oil cans into the mechanical sections. The cans are filled outside, placed on the car, and taken inside the mine, where the filled cans are exchanged for empty ones. Then the lubricant car and empty cans are taken outside. This system eliminates the need for storing more than a 1-day supply in the mine. It is recommended that this car be covered and provided with a lock; also, that fireproof facilities be provided for storing the small containers in the mechanical section.

The lower half of figure 6 is a diagram of a car used to distribute grease and oil daily to the mechanical sections. The lubricants are transferred into 5-gallon, spill-proof, metal oil cans housed in fireproof boxes near each mechanical unit. The machine operators procure lubricants for their mining equipment from this fireproof grease-storage box. The only grease that is not housed in a fireproof container is approximately 20 pounds kept near each loading machine in a pressure-type can.

Another satisfactory system is to build a special truck that will haul four drums of oil or grease into the mine.^{3/} The greasers couple the loaded truck to a locomotive and travel through the working sections to lubricate the loading machines and equipment. These trucks are equipped with two sets of hose and two pumps for the different grades of oil. The pumps are motor-driven and the hose are 30 to 40 feet long -- long enough to reach all parts of the equipment. This grease truck is taken outside the mine for storage when not in use, thereby eliminating the need for storage of grease inside the mine.

Transportation facilities such as those outlined make it unnecessary to store large amounts of oil and grease inside coal mines. The grease cars should be kept outside the mine except when in use. They should be kept covered and locked, and one person should be definitely responsible for filling and transporting the lubricant containers. The cars should be equipped with fire extinguishers and rock dust. Greasing should be done by regular greasers or mechanics working on the off shift or between shifts, whenever possible, thereby making it unnecessary to keep lubricants near machinery that is in operation.

^{3/} Hurst, William, How to Store and Use Mine Lubricants: Coal Age, vol. 41, No. 7, July 1936, pp. 287-289.

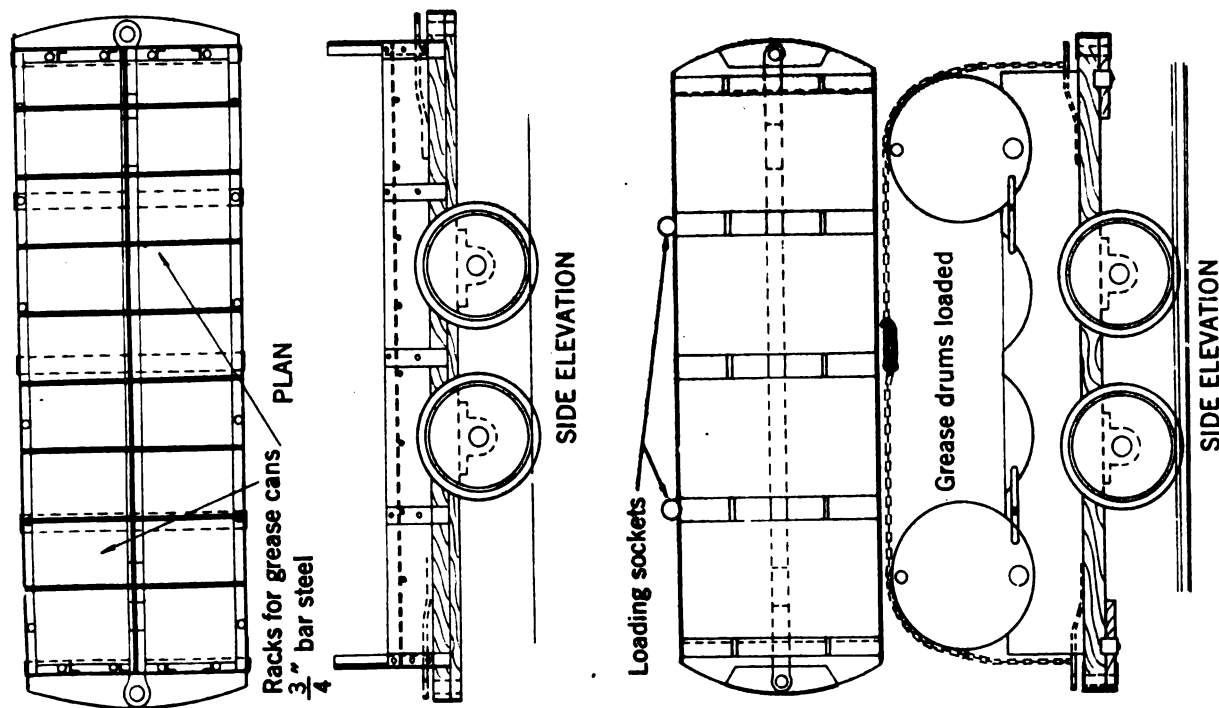


Figure 6.—Grease cars for transporting lubricants into the mine.

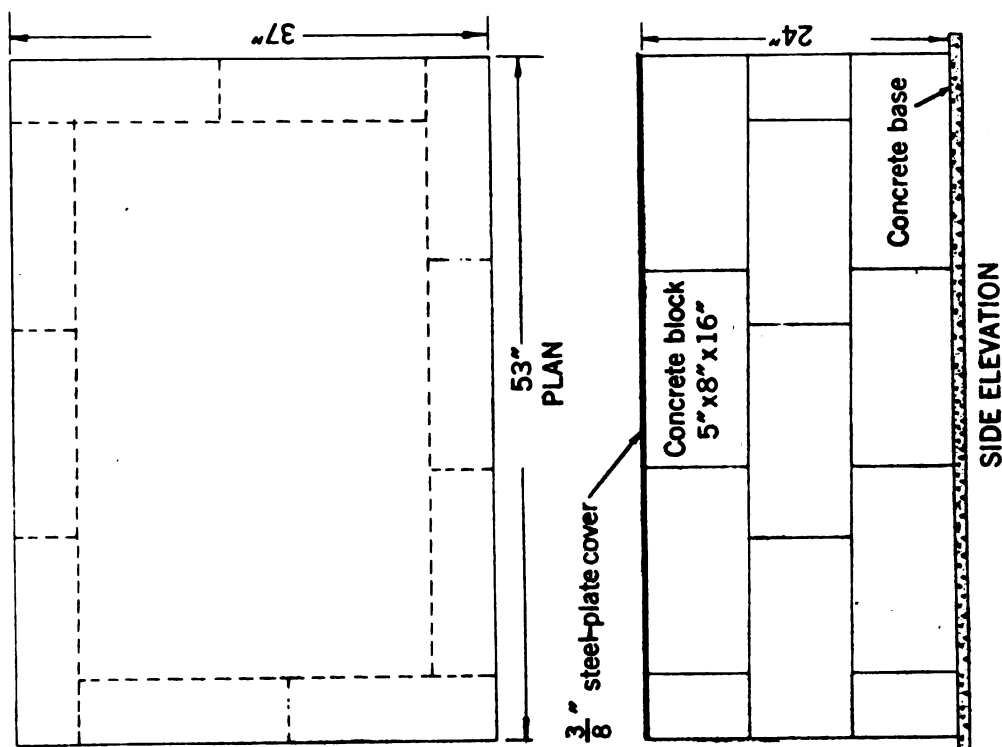


Figure 7.—Grease - storage box.

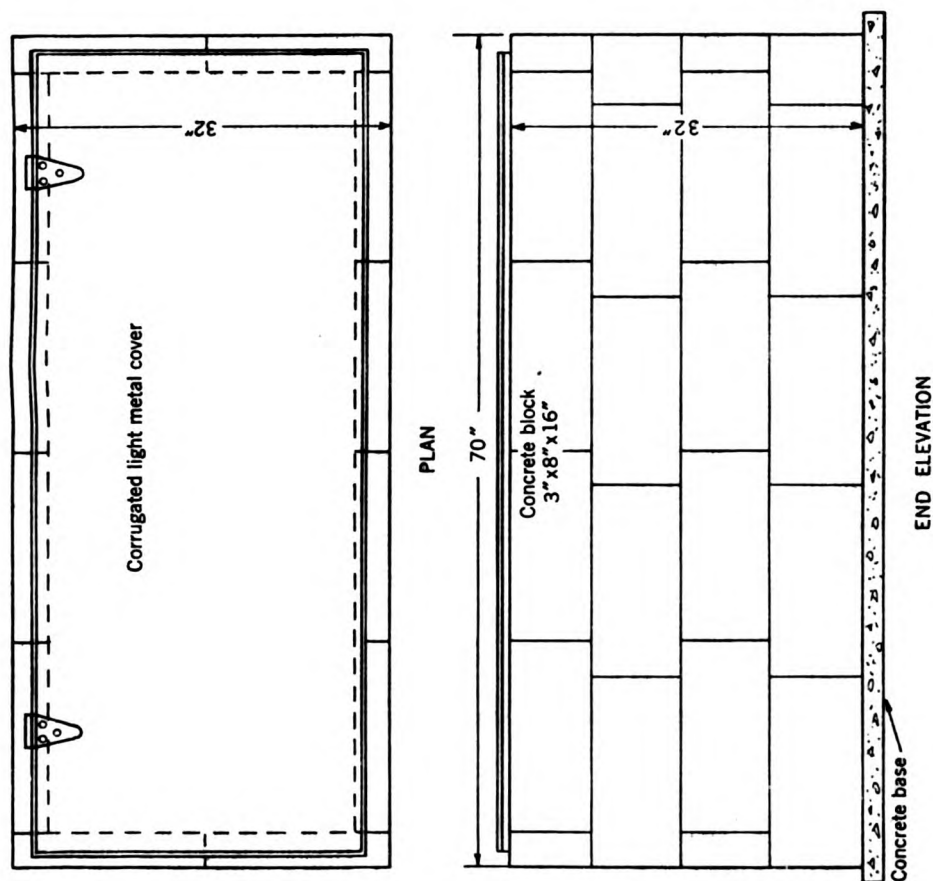


Figure 8.— Grease-storage box.

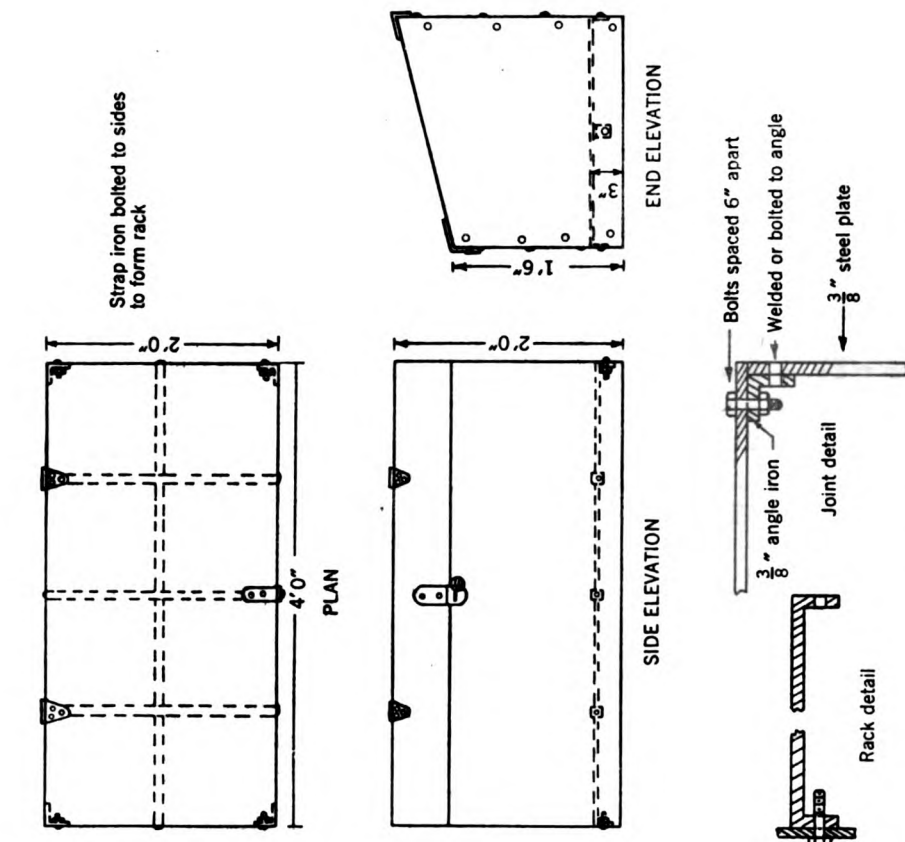


Figure 9.— Knockdown steel grease-storage box.

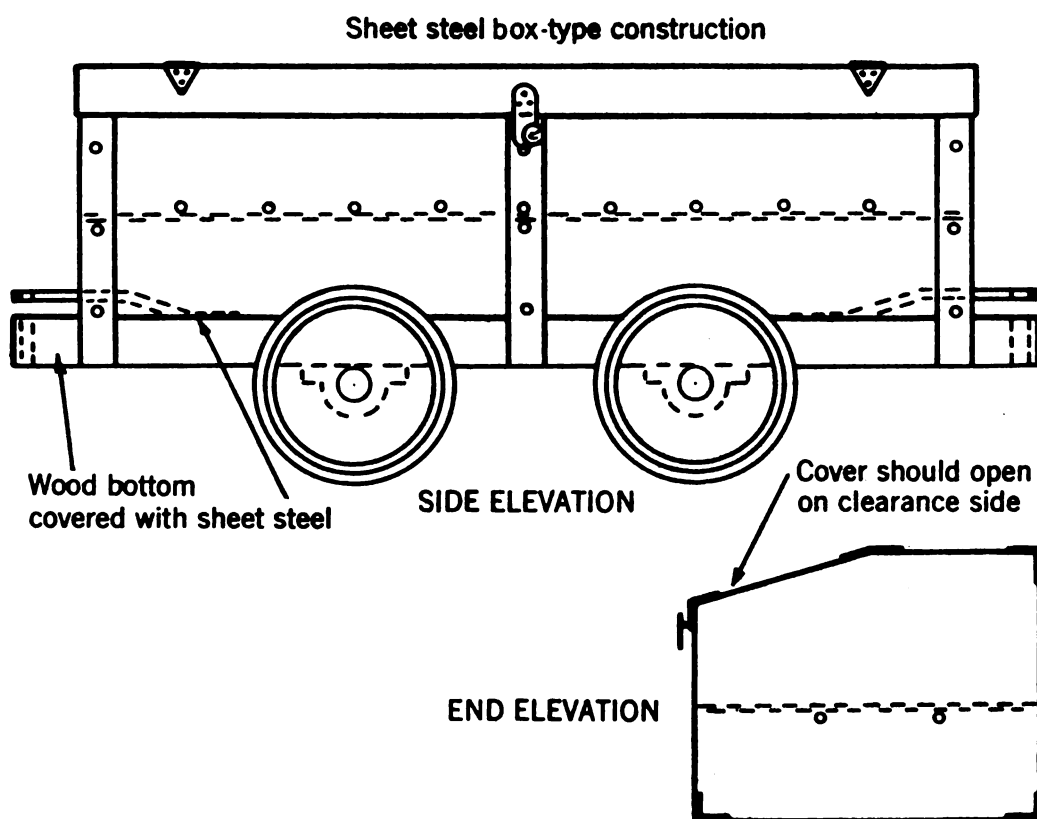
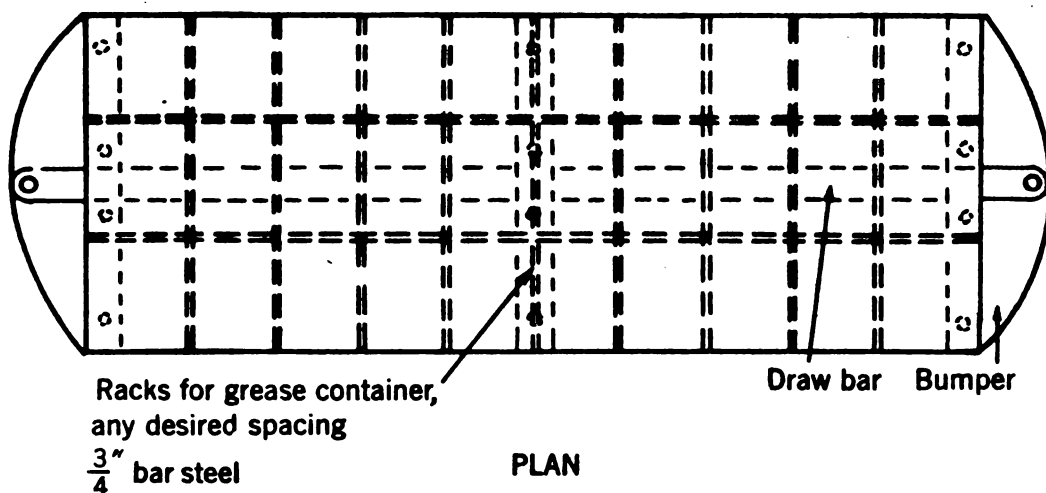


Figure 10.— Fireproof grease-storage car.

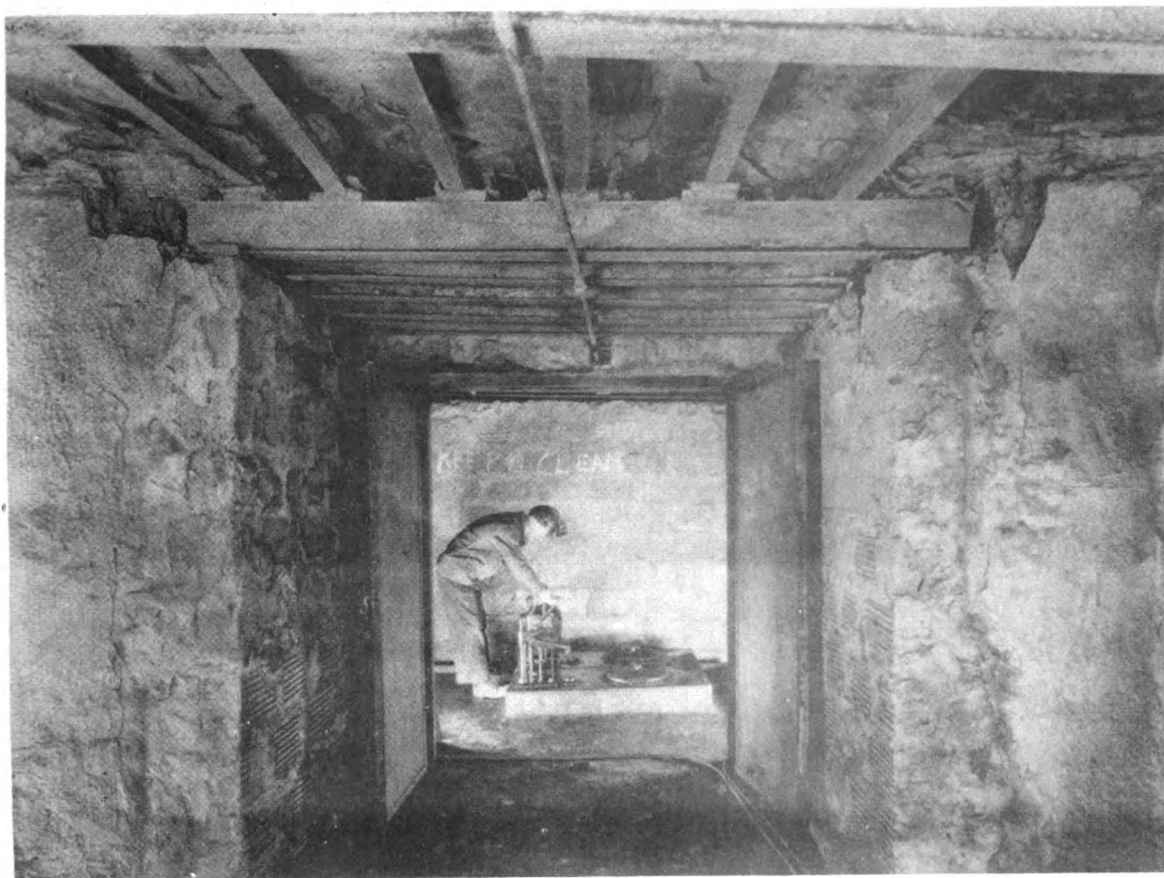


Figure 11.—Underground, fireproof, lubricant-storage house with sunken storage tanks.

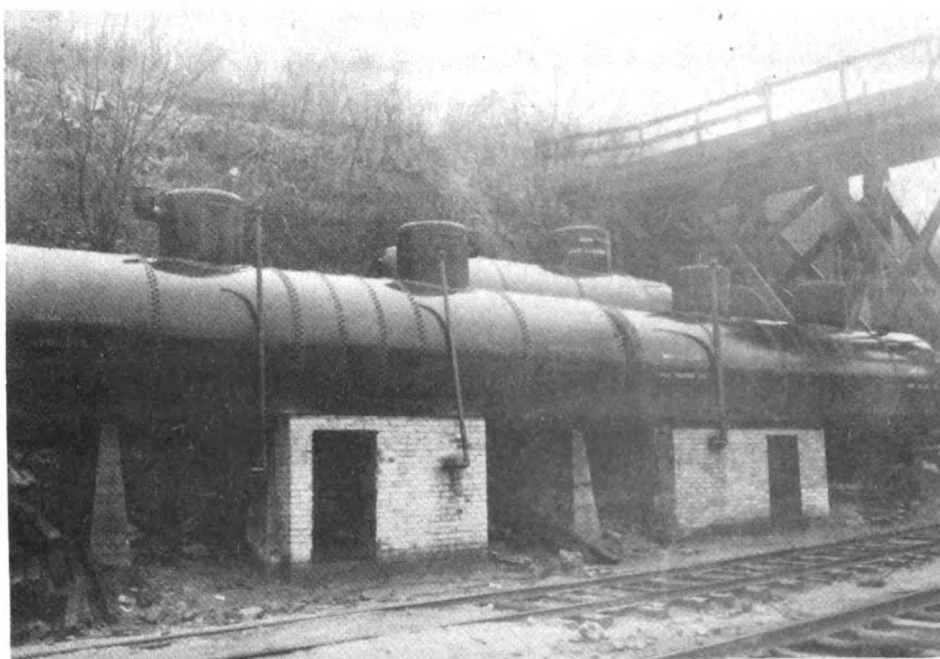


Figure 12.—Outside bulk storage tanks for mine lubricants.

FACILITIES FOR STORING LUBRICANTS NECESSARY TO MAINTAIN MECHANICAL EQUIPMENT IN MINES

The storage boxes illustrated in figures 7 and 8 are virtually alike and are used to store 3- to 5-gallon metal containers in the mechanical mining sections. These boxes are constructed of 5- by 8- by 16-inch concrete blocks placed on a concrete floor. The outside dimensions of the box shown in figure 7 are 24 by 37 by 53 inches. The outside dimensions of the box shown in figure 8 are 32 by 32 by 70 inches. A 3/8-inch steel plate serves as a cover for the box in figure 7, whereas the box in the upper half of figure 6 has a cover of corrugated light sheet steel. It is recommended that these covers be made to fit tightly, be supported by hinges, and be kept locked.

Figure 9 shows a portable, steel, knockdown-type storage box 4 by 2 by 2 feet constructed of 3/8-inch sheet steel and reinforced by 3/8-inch angle iron. The box is fitted with a hinged, locked, steel door. This box serves the same purpose as the two storage boxes previously mentioned but differs from them in that it can be knocked down and moved.

Figure 10 is a diagram of a portable, fireproof lubricant car used to store small quantities of lubricants in mechanical sections. This car can be placed convenient to the equipment, taken outside for refilling, and used to advantage by loading-machine operators or mechanics.

Figure 11 shows an inside fireproof oil-storage house equipped with steel doors and concrete walls and floor. The lubricant-storage tanks are sunk to nearly floor level, which provides extra safety. The heavy steel covers for these tanks are tight-fitting, and the tanks are kept covered unless they are being filled or possibly when lubricants are being extracted from them.

Lubricants of various grades are delivered to this storage house in drums. The drums are emptied into the storage tanks and are then taken outside. The small grease containers or grease guns used in lubricating the equipment are filled daily from the storage tanks by a hand-operated pump and are then sent to the section where incombustible storage boxes of the type shown in figure 7 are used. This method is efficient and avoids waste and contamination of lubricants. It also eliminates dangerous accumulations of spilled lubricants and the necessity for storing lubricants inside mines in partly filled and often open grease drums or cans.

Figure 12 shows an unusual method of storing lubricants outside. One company has installed five large tanks similar to the three shown in the illustration. These tanks store three different types of grease or oil, with connecting pipes controlled by valves. Uniform level can be maintained in tanks containing the same lubricants. These storage tanks are built adjacent to a railroad siding. Lubricants are purchased in tank-car lots; the tank car is pulled onto the siding, and the lubricant is pumped into the storage tanks by means of a pump and a system of pipe lines and valves, which eliminates handling of drums and virtually all spillage. These five tanks contain a total of 13,000 gallons Joy grease, 11,000 gallons hydraulic oil, and 10,000 gallons red oil.

Grease or lubricants are supplied to the pressure grease car as shown in figure 3. The lubricants, which flow by gravity into the car, require no special attention, as the time required to fill the car has been determined, and the supply man attends to other duties while the car is filling.

During cold weather, when the lubricants flow sluggishly, compressed air is piped to the tanks to force the material from the storage tank into the car. This system has many advantages, such as eliminating the handling of heavy drums and the need for outside storage buildings with their accompanying hazards. It also has the advantage of being more economical and requiring less labor to handle the lubricants.

Housing facilities of the types illustrated obviate the danger associated with storing the containers along ribs and in break-throughs, where fires could be started. The fireproof structures should be kept covered and locked and a section foreman should inspect them daily to see that they are kept clean and used properly. Fire extinguishers and rock dust should be kept outside the storage house for emergency use, and only spill-proof containers of one-shift capacity should be kept near operating equipment. Besides being spill-proof, the containers should be equipped with faucets or automatic closing lids. The storage houses should not be near doors used to direct ventilating currents, and only grease or oil should be kept in them.

In smaller mines that operate only a few units of mechanical equipment, the expenditure for elaborate grease-transportation facilities might not be warranted. However, spill-proof oil cans and approved-type grease guns of one-shift capacity should be provided, and they should be dispensed from an outside grease house at the beginning of each shift and returned at the end of the shift. Such containers can be transported by the machine runner or operator. If proper care is taken, and they are handled in the manner described, only enough lubricants for one shift will be stored in the mine.

RECOMMENDED PRACTICES FOR TRANSPORTING, STORING, AND HANDLING LUBRICANTS

1. Lubricants stored inside coal mines should be limited to small quantities and be kept in small spill-proof containers.
2. Fireproof buildings should be provided for the storage of lubricants.
3. Storage buildings for lubricants should be kept clean and free from oil or grease spillage, waste material, and material other than lubricants.
4. Approximately 1 day's supply of oil or grease is the maximum that should be taken or kept inside the mine at any time.
5. Fire-protection equipment, such as foam, carbon dioxide, or dry compound-type fire extinguishers should be installed at or near all oil-storage houses. A handy supply of rock dust would aid in at least some instances. Fire-protection equipment also should accompany lubricants being transported into the mine.

6. Lubricants should be taken into mechanical sections in covered, spill proof, metal containers that hold approximately 1 day's supply.

7. In rapidly moving, mechanical-mining sections, oil storage facilities should be provided by means of:

- a. Permanent fireproof buildings;
- b. Easily moved and assembled knockdown-type fireproof buildings of steel; and
- c. Portable, covered mine cars of fireproof construction.

8. All oil storage buildings and cars should be kept locked, and the responsibility for the proper distribution and disposition of lubricants should be assigned to one man.

9. Lubricating material should not be stored within 50 feet of any door used for controlling ventilation.

10. All outside storage houses should be at least 300 feet from mine openings or buildings.

11. Only enough lubricating oil for one shift should be provided for cutting machines. This oil should be kept in suitable grease or oil guns that can be fastened to the mining machine during the working shift and returned to the oil-storage house at the end of each shift.

12. Whenever possible, machinery and equipment should be lubricated on the idle shift or between shifts, by special crews using portable, fireproof lubricating cars and special equipment.

13. Whenever greasing is done at the working face, a supply of rock dust should be at hand and sprinkled over any spilled grease or oil.

14. Mine cars at the pit mouth or on mine bottoms should be lubricated by mechanical or electrical lubricating equipment. The lubricant should be stored in a fireproof building, and care should be taken to remove spilled lubricants from along tracks.